State of California
The Resources Agency
DEPARTMENT OF FISH AND GAME

STANDING STOCK OF TROUT IN A SECTION
OF WARD CREEK, PLUMAS COUNTY, 1990

by

Sharon Keeney
and
Charles J. Brown

Bay-Delta and Special Water
Projects Division

1992

STANDING STOCK OF TROUT IN A SECTION
OF WARD CREEK, PLUMAS COUNTY, 1990

INTRODUCTION

Trout were caught in Ward Creek (Figure 1) in September, 1990. Ward Creek was sampled as part of a continuing program sponsored by Department of Water Resources (DWR) which was designed to investigate the status of trout populations in tributaries to Indian Creek. Other tributaries sampled as part of this program include Red Clover Creek, Hungry Creek and Little Grizzly Creek. These creeks are sampled to provide information on trout life history and growth that will allow Indian Creek to be managed in a manner that will provide the best habitat for trout reproduction and survival. This is the first time Ward Creek has been sampled as part of the Indian Creek studies.

METHODS

The standing stock of trout was estimated at one station in Ward Creek in Plumas County. The length, average width, and average depth of the station were measured with a cloth tape (Appendix 1). Fish were captured with a battery-powered backpack electroshocker in a stream section blocked by seines. Captured fish were removed from the net-enclosed section on each pass. Standing stock estimates were developed using the multiple-pass method of Leslie and Davis (1939), with limits of confidence computed using a formula proposed by DeLury (1951).
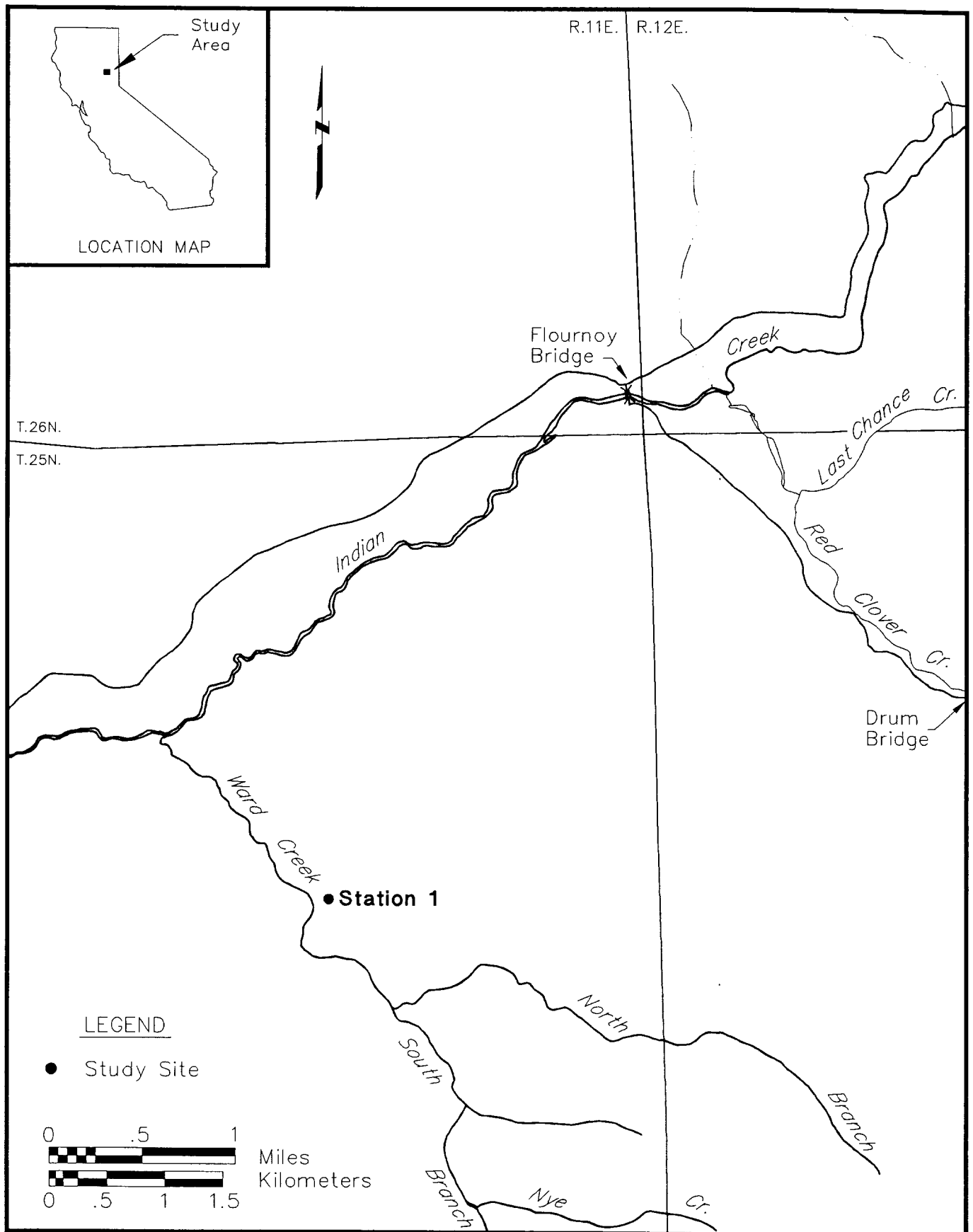
1

Figure 1. Station sampled to determine biomass of fishes in Ward Creek, Plumas County, August 1990.

The weights of rainbow trout (<u>Oncorhynchus</u> <u>mykiss</u>) were determined by displacement. Weights were measured for all fish caught. Fork length (FL) of each fish caught was measured to the nearest millimeter.

Scale samples were taken for rainbow trout at least 100 mm in length. Scales were mounted dry between microscope slides, and their images were projected on a NCR microfiche reader at a magnification of 42x. Scale measurement for the calculation of growth were recorded to the nearest millimeter along the anterior radius of the anterior-posterior axis of the scale.

Geometric mean functional regressions were used to describe the body-scale and length-weight relationships (Ricker 1975). Estimation of true mean growth rate (G) was calculated using methods of Ricker (op. cit.).

The standing crop of rainbow trout was calculated for the lone station. Age and growth were calculated for the population. Mean individual growth was calculated for rainbow trout in Ward Creek. Also, the coefficient of condition and 95% confidence intervals were calculated for rainbow trout.

Standing Crop

Rainbow trout was the only species caught in Ward Creek. The biomass was 4.4 g/m^2 (Table 1). Biomass of catchable trout ($\geq$127 mm FL) was 2.0 g/m^2.

TABLE 1. Estimate of Rainbow Trout Standing Crop in Ward Creek, Plumas County, 1990.

Population Estimate	95% Confidence Interval	Biomass g\m^2	Estimate of Catchable Trout ($\geq$127 mm FL)	Biomass of Catchable trout g\m^2
101	93-111	4.4	6	2.0

Age and Growth

The formula FL = 39.0 + 3.8 S describes the relationship between the fork length and enlarged scale radius (S) of 18 rainbow trout caught in Ward Creek. The coefficient of correlation (r^2) is 0.86.

Population and mean individual growth rates for 1+ rainbow trout were higher than those for age 2+ fish (Table 2).

TABLE 2.   Growth Rates for Rainbow Trout Caught in Ward Creek,
          Plumas County, 1990.

| | Population Growth | | | Mean Individual Growth | | |
Age Interval	Length Interval (mm)	Difference of Natural Logarithms	Instantaneous Growth Rate G_X	Length Interval (mm)	Difference of Natural Logarithms	Instantaneous Growth Rate G_X
1-2	81-159	0.609	1.8	89-159	0.580	1.7
2-3	159-202	0.305	0.9	138-202	0.381	1.1

Age 1+ rainbow trout averaged 127 mm in fork length. Only one 2+ fish was caught, and it measured 217 mm. One 3+ fish was caught; this trout measured 237 mm (Table 3).

TABLE 3.   Calculated Fork Length of Rainbow Trout Caught in Ward Creek,
          Plumas County, 1990.

Age	Number of Fish	Length at Capture (mm)	Calculated Lengths at Successive Annuli		
			1	2	3
1	21	127	81	–	–
2	1	217	89	159	–
3	1	237	84	138	202
Number of back-calculation	23				
Weighted Means (mm)			82	119	202
Increments			82	67	54

Length and Weight

Age group 0+ rainbow trout represented 81% of the catch. Age 1+ fish comprised 17% of the catch. Ages 2+ and 3+ made up the remaining 2%.

The relationship between length (L) and weight (W) of rainbow trout is:

$$Log_{10} W = -4.8 + 2.9 \ Log_{10}L$$

$$r^2 = 0.98$$

$$N = 93 \ (Figures \ 2 \ and \ 3) \ (Appendices \ 2 \ and \ 3)$$

Coefficient of Condition

We calculated the coefficient of condition and 95% confidence limits for 93 rainbow trout (Table 4). There is no significant difference between the coefficient of condition for any age group of rainbow trout we tested ("t" test, 0.05 level).

TABLE 4. Condition of Rainbow Trout in Ward Creek, Plumas County, 1990.

Age Group	Number of Fish	Coefficient of Condition	95% Confidence Interval
0+	70	1.0875	0.6697 – 1.5053
1+	21	1.0086	0.8089 – 1.2084
2+ and 3+	2	.9645	0.8409 – 1.0880
combined	93	1.0670	0.6852 – 1.4488
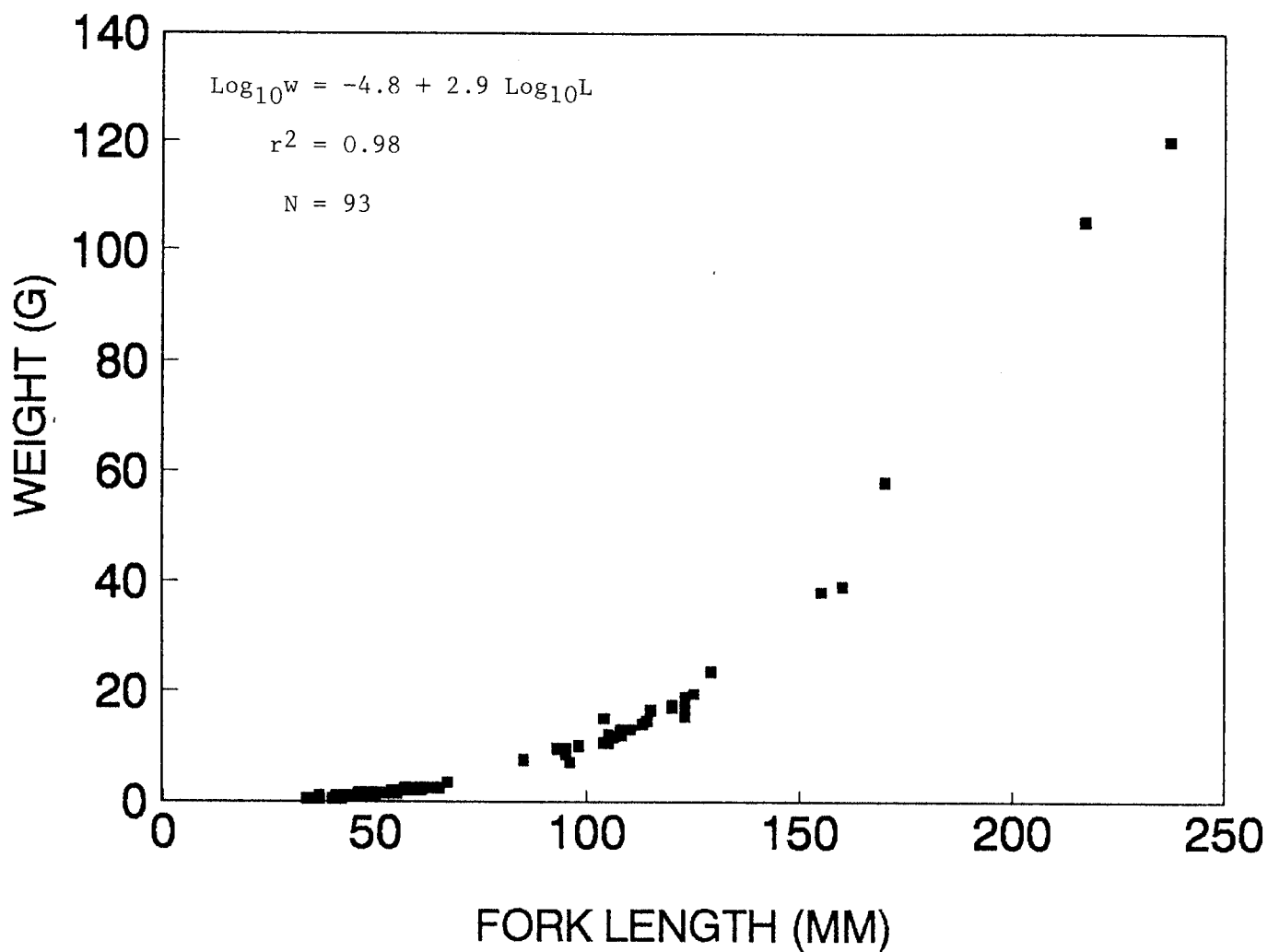
FIGURE 2. The relationship between length and weight of rainbow trout caught in sections of Ward Creek, Plumas County, 1990.
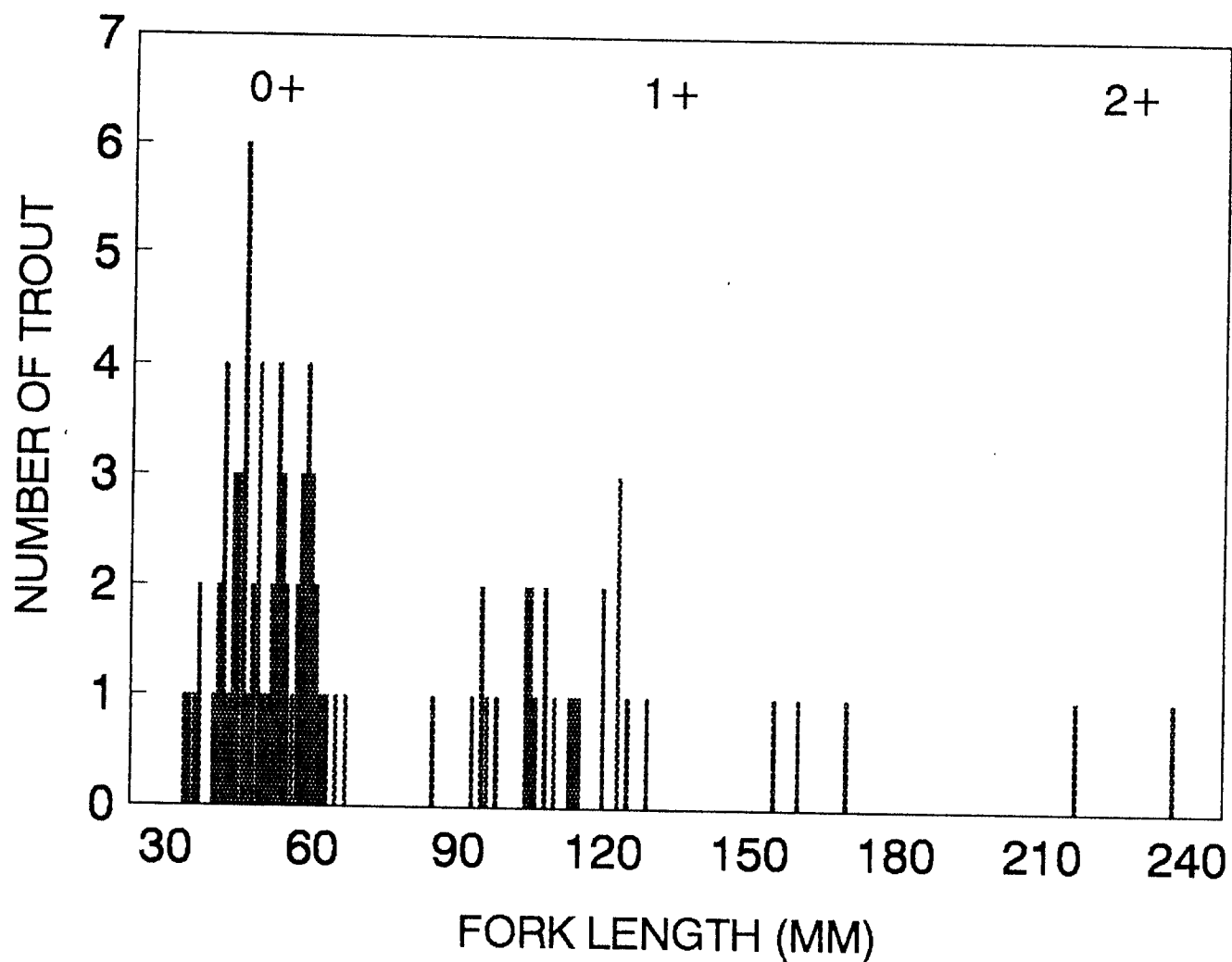
FIGURE 3. Length, observed frequency and age of rainbow trout caught in Ward Creek, Plumas County, 1990.

We were unable to age one rainbow trout from the scale samples, but it was included in the combined coefficient of condition and 95% confidence interval.

We sampled five stations in four streams. All the streams held rainbow trout. Only two also contained brown trout. Population estimates averaged 81 rainbow trout per station. Biomass averaged 4.2 g/m^2 (Table 5). An average of four brown trout were caught in two stations. Biomass averaged 1.3 g/m^2 (Table 6).

TABLE 5. Estimates of Rainbow Trout Standing Crop and Biomass in Four Tributaries to Indian Creek, 1990.

Stream	Number of Stations	Average Number of Trout	Average Biomass (g/m^2)
Red Clover Creek	2	49	4.6
Hungry Creek	1	76	2.8
Little Grizzly Creek	1	131	4.6
Ward Creek	1	101	4.4
Average		81	4.2

TABLE 6. Estimates of Brown Trout Standing Crop and Biomass in Four Tributaries to Indian Creek, 1990.

Stream	Number of Stations	Average Number of Trout	Average Biomass (g/m^2)
Red Clover Creek	2	3	0.1
Hungry Creek	1	4	2.4
Little Grizzly Creek	1	0	-
Ward Creek	1	0	-
Average		3	0.9

LITERATURE CITED

DeLury, D.B. 1951. On the planning of experiments for the estimate of fish populations. J. Fish Res. Bd. Canada. 8:281-307.

Leslie, P.H., and D.H.S. Davis. 1939. An attempt to determine the absolute number of rats in a given area. J. Animal Ecology. 8:94 - 113.

Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Fish. Res. Bd. Canada. Bull. 191, 382 p.

APPENDIX 1

PERMANENT FISH POPULATION STATION
WARD CREEK, PLUMAS COUNTY
SEPTEMBER 1990

Station 1 - Station 1 is located 1.9 stream kilometers above the confluence of Ward Creek and Indian Creek (947 327 UTM). This station is heavily shaded by riparian vegetation. The substrate is predominately gravel and cobbles. Most of this section is riffle (75%); however, a pool at the middle and end of the section made up 25% of the surface area. The station is 48.5 m long, has a surface area of 194.0 m^2 and a volume of 36.9 m^3 at 0.08 cms.

APPENDIX 2

LENGTH AND NUMBER OF RAINBOW TROUT
CAUGHT IN WARD CREEK, 1990

Fork Length (mm)	Frequency	Fork Length (mm)	Frequency
34	1	62	1
35	1	63	1
36	1	65	1
37	2	67	1
40	1	85	1
41	2	93	1
42	4	95	2
43	1	96	1
44	3	98	1
45	3	104	2
46	6	105	2
47	1	106	1
48	2	108	2
49	4	110	1
50	1	113	1
51	1	114	1
52	2	115	1
53	4	120	2
54	3	123	3
55	2	125	1
56	1	129	1
57	2	155	1
58	3	160	1
59	4	170	1
60	3	217	1
61	2	237	1

APPENDIX 3

LENGTH AND WEIGHT OF RAINBOW TROUT
CAUGHT IN WARD CREEK, 1990

Fork Length (mm)	Weight (g)	Fork Length (mm)	Weight (g)
34	0.5	62	2.5
35	0.5	63	2.5
36	0.5	65	2.5
37	1,1.5	67	3.5
40	0.5	85	7.5
41	1,0.5	93	9.5
42	0.5,0.5,1,1	95	8.5,9.5
43	1	96	7
44	1,1,1	98	10
45	1,1,1	104	10.5,15
46	1,1,1,1,1.5,1.5	105	10.5,12
47	1	106	11.5
48	1,1.5	108	12,13
49	1,1,1.5,1.5	110	10
50	1	113	14
51	1.5	114	14.5
52	1.5,1.5	115	16.5
53	1.5,1.5,1.5,1.5	120	17,17.5
54	1.5,1.5,2	123	15.5,17,16
55	1.5,2	125	19.5
56	2	129	23.5
57	2,2.5	155	38
58	2,2.5,2.5	160	39
59	2,2,2,2.5	170	58
60	2,2,2	217	105
61	2,2.5	237	120